

U.S. Patent Application Serial No. 09/787,614
Amendment filed **July 25, 2006**
Reply to OA dated May 15, 2006

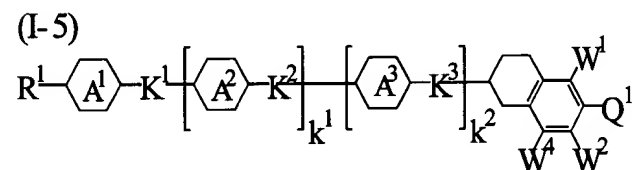
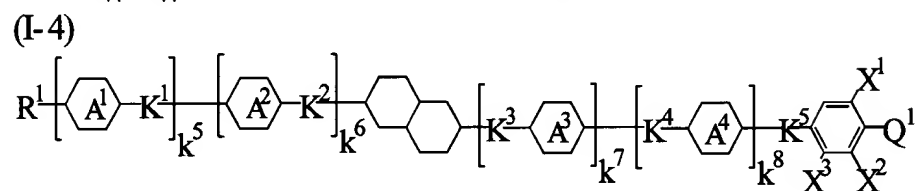
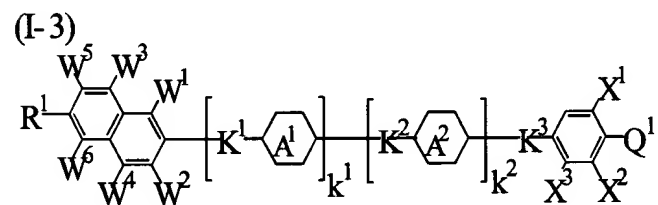
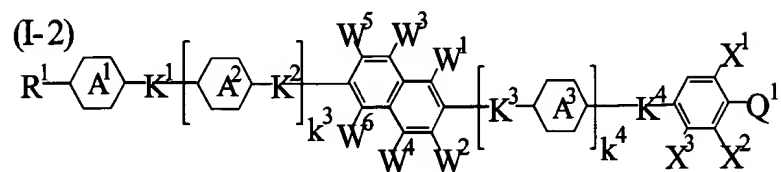
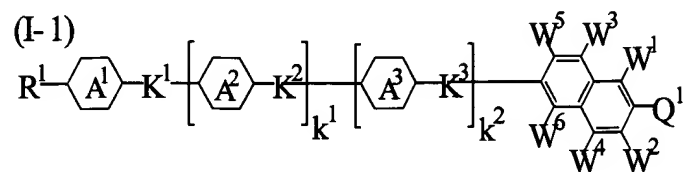
AMENDMENTS TO THE CLAIMS:

Please amend claims 3 and 4, as follows. This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim 1 (Previously Presented): A nematic liquid crystal composition comprising a liquid crystal component A composed of two or more kinds of compounds represented by two or three or more general formulas selected from the general formulas (I-1) to (I-5):

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(wherein one, or two or more CH groups, which are present in a naphthalene-2,6-diyl ring, may be substituted with a N group,

one, or two or more $-\text{CH}_2-$ groups, which are present in a decahydronaphthalene-2,6-diyl ring, may be substituted with $-\text{CF}_2-$, one, or two or more $-\text{CH}_2-\text{CH}_2-$ groups, which are present in said ring, may be substituted with $-\text{CH}_2\text{O}-$, $-\text{CH}=\text{CH}-$, $-\text{CH}=\text{CF}-$, $-\text{CF}=\text{CF}-$, $-\text{CH}=\text{N}-$ or $-\text{CF}=\text{N}-$, one, or two or more $>\text{CH}-\text{CH}_2-$ groups, which are present in said ring, may be substituted with $>\text{CH}-\text{O}-$, $>\text{C}=\text{CH}-$, $>\text{C}=\text{CF}-$, $>\text{C}=\text{N}-$ or $>\text{N}-\text{CH}_2-$, a $>\text{CH}-\text{CH}<$ group, which is present in the ring, may be substituted with $>\text{CH}-\text{CF}<$, $>\text{CF}-\text{CF}<$ or $>\text{C}=\text{C}<$, and at least one C in said non-substituted or substituted ring may be substituted with Si;

R^1 each independently represents an alkyl group having 1 to 10 carbon atoms or an alkenyl group having 2 to 10 carbon atoms, said alkyl or alkenyl group can have one, or two or more F, Cl, CN, CH_3 or CF_3 as a non-substituent or substituent group, and one, or two or more CH_2 group, which are present in said alkyl or alkenyl group, may be substituted with O, CO or COO, while O atoms do not bond with each other directly;

Q^1 each independently represents F, Cl, CF_3 , OCF_3 , OCF_2H , OCFH_2 , or NCS;

X^1 to X^2 each independently represents H, F, Cl, CF_3 , OCF_3 , or CN; X^3 each independently represents H, F, Cl, CF_3 , OCF_3 , CN, or CH_3 ;

W^1 to W^6 each independently represents H, F, Cl, CF_3 , OCF_3 , or CN, and also W^4 each independently represents CH_3 ;

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K^1 to K^5 each independently represents, a single bond, $-\text{COO}-$, $-\text{OCO}-$, $-\text{CH}_2\text{O}-$, $-\text{OCH}_2-$, $-\text{CH}=\text{CH}-$, $-\text{CF}=\text{CF}-$, $-\text{C}\equiv\text{C}-$, $-(\text{CH}_2)_2-$, $-(\text{CH}_2)_4-$, $-\text{CH}=\text{CH}-(\text{CH}_2)_2-$, $-(\text{CH}_2)_2-\text{CH}=\text{CH}-$, $-\text{CH}=\text{N}-$, $=\text{CH}=\text{N}-\text{N}=\text{CH}-$, or $-\text{N}(\text{O})=\text{N}-$;

rings A^1 to A^4 each independently represents 1,4-phenylene, 2- or 3-fluoro-1,4-phenylene, 2,3-difluoro-1,4-phenylene, 3,5-difluoro-1,4-phenylene, 2- or 3-chloro-1,4-phenylene, 2,3-dichloro-1,4-phenylene, 3,5-dichloro-1,4-phenylene, pyrimidine-2,5-diyl, trans-1,4-cyclohexylene, trans-1,4-cyclohexenylenyl, trans-1,3-dioxane-2,5-diyl, trans-1-sila-1,4-cyclohexylene, trans-4-sila-1,4-cyclohexylene, naphthalene-2,6-diyl, 1,2,3,4-tetrahydronaphthalene-2,6-diyl, or decahydronaphthalene-2,6-diyl, and naphthalene-2,6-diyl and 1,2,3,4-tetrahydronaphthalene-2,6-diyl can have one, or two or more F, Cl, CF_3 , OCF_3 or CH_3 as a non-substituent or substituent group;

one, or two or more hydrogen atoms, which are present in a naphthalene-2,6-diyl ring, a 1,2,3,4-tetrahydronaphthalene-2,6-diyl ring, a decahydronaphthalene-2,6-diyl ring, a side chain group R^1 , a polar group Q^1 , linking groups K^1 to K^5 and rings A^1 to A^4 , may be substituted with a deuterium atom;

k^1 to k^8 each independently represents 0 or 1, $k^3 + k^4$ is 0 or 1, and $k^5 + k^6 + k^7 + k^8$ is 0, 1 or 2; and

atoms, which constitute the compounds of the general formulas (I-1) to (I-5), may be substituted with isotope atoms thereof); 0 to 99.9% by weight of a liquid crystal component B composed of a compound having a dielectric constant anisotropy of +2 or more as a liquid crystal component excluding the compounds of the general formulas (I-1) to (I-5); and 0 to 85% by weight

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of a liquid crystal component C composed of a compound having a dielectric constant anisotropy within a range from -10 to $+2$; the sum total of said liquid crystal component B and said liquid crystal component C being within a range from 0 to 99.9% by weight.

Claim 2 (Original): A nematic liquid crystal composition according to claim 1, wherein said liquid crystal component A satisfies at least one of the following conditions:

(i) said liquid crystal component A contains one, or two or more kinds of compounds selected from compounds represented by the general formula (I-1) and one, or two or more kinds of compounds selected from compounds represented by the general formula (I-2), the content of said selected compounds in said liquid crystal component A being within a range from 5 to 100% by weight;

(ii) said liquid crystal component A contains one, or two or more kinds of compounds selected from compounds represented by the general formula (I-1) and one, or two or more kinds of compounds selected from compounds represented by the general formula (I-3), the content of said selected compounds in said liquid crystal component A being within a range from 5 to 100% by weight;

(iii) said liquid crystal component A contains one, or two or more kinds of compounds selected from compounds represented by the general formula (I-1) and one, or two or more kinds of compounds selected from compounds represented by the general formula (I-4), the content of said

selected compounds in said liquid crystal component A being within a range from 5 to 100% by weight;

(iv) said liquid crystal component A contains one, or two or more kinds of compounds selected from compounds represented by the general formula (I-1) and one, or two or more kinds of compounds selected from compounds represented by the general formula (I-5), the content of said selected compounds in said liquid crystal component A being within a range from 5 to 100% by weight;

(v) said liquid crystal component A contains one, or two or more kinds of compounds selected from compounds represented by the general formula (I-2) and one, or two or more kinds of compounds selected from compounds represented by the general formula (I-3), the content of said selected compounds in said liquid crystal component A being within a range from 5 to 100% by weight;

(vi) said liquid crystal component A contains one, or two or more kinds of compounds selected from compounds represented by the general formula (I-2) and one, or two or more kinds of compounds selected from compounds represented by the general formula (I-4), the content of said selected compounds in said liquid crystal component A being within a range from 5 to 100% by weight;

(vii) said liquid crystal component A contains one, or two or more kinds of compounds selected from compounds represented by the general formula (I-2) and one, or two or more kinds of compounds selected from compounds represented by the general formula (I-5), the content of said

selected compounds in said liquid crystal component A being within a range from 5 to 100% by weight;

(viii) said liquid crystal component A contains one, or two or more kinds of compounds selected from compounds represented by the general formula (I-3) and one, or two or more kinds of compounds selected from compounds represented by the general formula (I-4), the content of said selected compounds in said liquid crystal component A being within a range from 5 to 100% by weight;

(ix) said liquid crystal component A contains one, or two or more kinds of compounds selected from compounds represented by the general formula (I-3) and one, or two or more kinds of compounds selected from compounds represented by the general formula (I-5), the content of said selected compounds in said liquid crystal component A being within a range from 5 to 100% by weight;

(x) said liquid crystal component A contains one, or two or more kinds of compounds selected from compounds represented by the general formula (I-4) and one, or two or more kinds of compounds selected from compounds represented by the general formula (I-5), the content of said selected compounds in said liquid crystal component A being within a range from 5 to 100% by weight;

(xi) said liquid crystal component A contains one, or two or more kinds of compounds selected from compounds represented by the general formula (I-1), one, or two or more kinds of compounds selected from compounds represented by the general formula (I-2) and one, or two or

more kinds of compounds selected from compounds represented by the general formula (I-3), the content of said selected compounds in said liquid crystal component A being within a range from 5 to 100% by weight;

(xii) said liquid crystal component A contains one, or two or more kinds of compounds selected from compounds represented by the general formula (I-1), one, or two or more kinds of compounds selected from compounds represented by the general formula (I-2) and one, or two or more kinds of compounds selected from compounds represented by the general formula (I-4), the content of said selected compounds in said liquid crystal component A being within a range from 5 to 100% by weight;

(xiii) said liquid crystal component A contains one, or two or more kinds of compounds selected from compounds represented by the general formula (I-1), one, or two or more kinds of compounds selected from compounds represented by the general formula (I-2) and one, or two or more kinds of compounds selected from compounds represented by the general formula (I-5), the content of said selected compounds in said liquid crystal component A being within a range from 5 to 100% by weight;

(xiv) said liquid crystal component A contains one, or two or more kinds of compounds selected from compounds represented by the general formula (I-1), one, or two or more kinds of compounds selected from compounds represented by the general formula (I-3) and one, or two or more kinds of compounds selected from compounds represented by the general formula (I-4), the content of said selected compounds in said liquid crystal component A being within a range from

5 to 100% by weight;

(xv) said liquid crystal component A contains one, or two or more kinds of compounds selected from compounds represented by the general formula (I-1), one, or two or more kinds of compounds selected from compounds represented by the general formula (I-3) and one, or two or more kinds of compounds selected from compounds represented by the general formula (I-5), the content of said selected compounds in said liquid crystal component A being within a range from 5 to 100% by weight;

(xvi) said liquid crystal component A contains one, or two or more kinds of compounds selected from compounds represented by the general formula (I-1), one, or two or more kinds of compounds selected from compounds represented by the general formula (I-4) and one, or two or more kinds of compounds selected from compounds represented by the general formula (I-5), the content of said selected compounds in said liquid crystal component A being within a range from 5 to 100% by weight;

(xvii) said liquid crystal component A contains one, or two or more kinds of compounds selected from compounds represented by the general formula (I-2), one, or two or more kinds of compounds selected from compounds represented by the general formula (I-3) and one, or two or more kinds of compounds selected from compounds represented by the general formula (I-4), the content of said selected compounds in said liquid crystal component A being within a range from 5 to 100% by weight;

(xviii) said liquid crystal component A contains one, or two or more kinds of compounds

selected from compounds represented by the general formula (I-2), one, or two or more kinds of compounds selected from compounds represented by the general formula (I-3) and one, or two or more kinds of compounds selected from compounds represented by the general formula (I-5), the content of said selected compounds in said liquid crystal component A being within a range from 5 to 100% by weight;

(xix) said liquid crystal component A contains one, or two or more kinds of compounds selected from compounds represented by the general formula (I-2), one, or two or more kinds of compounds selected from compounds represented by the general formula (I-4) and one, or two or more kinds of compounds selected from compounds represented by the general formula (I-5), the content of said selected compounds in said liquid crystal component A being within a range from 5 to 100% by weight;

(xx) said liquid crystal component A contains one, or two or more kinds of compounds selected from compounds represented by the general formula (I-3), one, or two or more kinds of compounds selected from compounds represented by the general formula (I-4) and one, or two or more kinds of compounds selected from compounds represented by the general formula (I-5), the content of said selected compounds in said liquid crystal component A being within a range from 5 to 100% by weight;

(xxi) said liquid crystal component A contains one, or two or more kinds of compounds selected from compounds represented by the general formula (I-1), one, or two or more kinds of compounds selected from compounds represented by the general formula (I-2), one, or two or more

kinds of compounds selected from compounds represented by the general formula (I-3) and one, or two or more kinds of compounds selected from compounds represented by the general formula (I-4), the content of said selected compounds in said liquid crystal component A being within a range from 5 to 100% by weight;

(xxii) said liquid crystal component A contains one, or two or more kinds of compounds selected from compounds represented by the general formula (I-1), one, or two or more kinds of compounds selected from compounds represented by the general formula (I-2), one, or two or more kinds of compounds selected from compounds represented by the general formula (I-3) and one, or two or more kinds of compounds selected from compounds represented by the general formula (I-5), the content of said selected compounds in said liquid crystal component A being within a range from 5 to 100% by weight;

(xxiii) said liquid crystal component A contains one, or two or more kinds of compounds selected from compounds represented by the general formula (I-1), one, or two or more kinds of compounds selected from compounds represented by the general formula (I-2), one, or two or more kinds of compounds selected from compounds represented by the general formula (I-4) and one, or two or more kinds of compounds selected from compounds represented by the general formula (I-5), the content of said selected compounds in said liquid crystal component A being within a range from 5 to 100% by weight;

(xxiv) said liquid crystal component A contains one, or two or more kinds of compounds selected from compounds represented by the general formula (I-1), one, or two or more kinds of

compounds selected from compounds represented by the general formula (I-3), one, or two or more kinds of compounds selected from compounds represented by the general formula (I-4) and one, or two or more kinds of compounds selected from compounds represented by the general formula (I-5), the content of said selected compounds in said liquid crystal component A being within a range from 5 to 100% by weight;

(xxv) said liquid crystal component A contains one, or two or more kinds of compounds selected from compounds represented by the general formula (I-2), one, or two or more kinds of compounds selected from compounds represented by the general formula (I-3), one, or two or more kinds of compounds selected from compounds represented by the general formula (I-4) and one, or two or more kinds of compounds selected from compounds represented by the general formula (I-5), the content of said selected compounds in said liquid crystal component A being within a range from 5 to 100% by weight;

(xxvi) said liquid crystal component A contains one, or two or more kinds of compounds selected from compounds represented by the general formula (I-1), one, or two or more kinds of compounds selected from compounds represented by the general formula (I-2), one, or two or more kinds of compounds selected from compounds represented by the general formula (I-3), one, or two or more kinds of compounds selected from compounds represented by the general formula (I-4) and one, or two or more kinds of compounds selected from compounds represented by the general formula (I-5), the content of said selected compounds in said liquid crystal component A being within a range from 10 to 100% by weight;

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(xxvii) said liquid crystal component A contains one, or two or more kinds of compounds selected from compounds represented by the general formula (I-1), the content of said selected compounds in said liquid crystal component A being within a range from 5 to 100% by weight;

(xxviii) said liquid crystal component A contains one, or two or more kinds of compounds selected from compounds represented by the general formula (I-2), the content of said selected compounds in said liquid crystal component A being within a range from 5 to 100% by weight;

(xxix) said liquid crystal component A contains one, or two or more kinds of compounds selected from compounds represented by the general formula (I-3), the content of said selected compounds in said liquid crystal component A being within a range from 5 to 100% by weight;

(xxx) said liquid crystal component A contains one, or two or more kinds of compounds selected from compounds represented by the general formula (I-4), the content of said selected compounds in said liquid crystal component A being within a range from 5 to 100% by weight; and

(xxxi) said liquid crystal component A contains one, or two or more kinds of compounds selected from compounds represented by the general formula (I-5), the content of said selected compounds in said liquid crystal component A being within a range from 5 to 100% by weight.

Claim 3 (Currently amended): A nematic liquid crystal composition according to claim 1, wherein said liquid crystal component A contains one to twenty kinds of compounds selected from one, two, or three or more sub-groups among the following sub-groups (1-ai) to (1-avii), the content of said compounds being within a range from 10 to 100% by weight:

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(I-ai) compound in which R¹ is an alkyl or alkenyl group having 2 to 7 carbon atoms,

(I-aii) compound in which Q¹ is F, Cl, CF₃, OCF₃, or OCF₂H, ~~or~~ ~~CN~~,

(I-aiii) compound in which K¹ to K⁵ represent single bond, -(CH₂)₂-, -COO-, or -C≡C-,

(I-aiv) compound in which rings A¹ to A⁴ represent trans-1,4- cyclohexylene, 1,4-phenylene, 3-fluoro-1,4-phenylene, or 3,5- difluoro-1,4-phenylene, and

(I-av) compound in which one, or two or more hydrogen atoms, which are present in naphthalene-2,6-diyl ring, a 1,2,3,4- tetrahydronaphthalene-2,6-diyl ring, a decahydronaphthalene- 2,6-diyl ring, a side chain group R¹, a polar group Q¹, linking groups K¹ to K⁵ and rings A¹ to A⁴, are substituted with deuterium atoms, in the general formulas (I-1) to (I-5);

(I-avi) compound in which W¹ to W³ represent H, F, Cl, CF₃, or OCF₃ in the general formulas (I-1) to (I-3) and (I-5); and

(I-avii) compound in which X¹ and X² represent H, F, Cl, CF₃, or OCF₃ in the general formulas (I-2) to (I-4) .

Claim 4 (Currently amended): A nematic liquid crystal composition according to claim 1, wherein said liquid crystal component A contains one to twenty kinds of compounds selected from one, two, or three or more sub-groups among the following sub-groups (I-bi) to (I-bxi), the content of said compounds being within a range from 5 to 100% by weight:

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(I-bi) compound in which $k^1=k^2=0$, the ring A^1 is trans-1,4-cyclohexylene, 1,4-phenylene, 3-fluoro-1,4-phenylene, 3,5-difluoro-1,4-phenylene, naphthalene-2,6-diyl, 1,2,3,4-tetrahydronaphthalene-2,6-diyl, or decahydronaphthalene-2,6-diyl, K^1 is a single bond, $-(CH_2)_2-$, $-COO-$, or $-C\equiv C-$, and

(I-bii) compound in which $k^1=1$, $k^2=0$, rings A^1 and A^2 represent trans-1,4-cyclohexylene, 1,4-phenylene, 3-fluoro-1,4-phenylene, 3,5-difluoro-1,4-phenylene, naphthalene-2,6-diyl, 1,2,3,4-tetrahydronaphthalene-2,6-diyl, or decahydronaphthalene-2,6-diyl, K^1 is a single bond, $-(CH_2)_2-$, $-COO-$, or $-C\equiv C-$, K^1 and K^2 represent a single bond, $-(CH_2)_2-$, $-COO-$, or $-C\equiv C-$, in the general formula (I-1) in which R^1 is an alkyl or alkenyl group having 2 to 7 carbon atoms, Q^1 is F, Cl, CF_3 , or OCF_3 , ~~or CN~~, and W^1 to W^3 each represents H, F, Cl, CF_3 , or OCF_3 ;

(I-biii) compound in which $k^3=k^4=0$, the ring A^1 is trans-1,4-cyclohexylene, 1,4-phenylene, 3-fluoro-1,4-phenylene, or 3,5-difluoro-1,4-phenylene, and K^1 and K^4 represent a single bond, $-(CH_2)_2-$, $-COO-$, or $-C\equiv C-$, in the general formula (I-2) in which R^1 is an alkyl or alkenyl group having 2 to 7 carbon atoms, Q^1 is F, Cl, CF_3 , or OCF_3 , ~~or CN~~, X^1 and X^2 represent H, F, Cl, CF_3 , or OCF_3 , and W^1 to W^3 represent H, F, Cl, CF_3 , or OCF_3 ;

(I-biv) compound in which $k^1=k^2=0$, K^3 is a single bond, $-COO-$, or $-C\equiv C-$, and

(I-bv) compound in which $k^1=1$, $k^2=0$, the ring A^1 is 1,4-phenylene, 3-fluoro-1,4-phenylene, or a 3,5-difluoro-1,4-phenylene, K^1 and K^3 represent single bond, $-COO-$ or $-C\equiv C-$, in the general formula (I-3) in which R^1 is an alkyl or alkenyl group having 2 to 7 carbon atoms, Q^1 is F, Cl, CF_3 , or OCF_3 , ~~or CN~~, X^1 and X^2 represent H, F, Cl, CF_3 , or OCF_3 , and W^1 to W^3 represent H, F, Cl, CF_3 , or OCF_3 ;

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(I-bvi) compound in which $k^5=k^6=k^7=k^8=0$, K^5 is a single bond, $-(CH_2)_2-$, $-(CH_2)_4-$, $-COO-$, or $-C\equiv C-$,

(I-bvii) compound in which $k^5=1$, $k^6=k^7=k^8=0$, the ring A^1 is trans-1,4-cyclohexylene, 1,4-phenylene, 3-fluoro-1,4-phenylene, or 3,5-difluoro-1,4-phenylene, K^1 and K^5 represent a single bond, $-(CH_2)_2-$, $-COO-$, or $-C\equiv C-$,

(I-bviii) compound in which $k^7=1$, $k^5=k^6=k^8=0$, the ring A^3 is trans-1,4-cyclohexylene, 1,4-phenylene, 3-fluoro-1,4-phenylene, or 3,5-difluoro-1,4-phenylene, K^3 and K^5 represent a single bond, $-(CH_2)_2-$, $-COO-$, or $-C\equiv C-$, and

(I-bix) compound in which the decahydronaphthalene-2,6-diyl ring has at least one substituent among substituents $-CF_2-$, $-CH_2-O-$, $-CH=CH-$, $-CH=CF-$, $-CF=CF-$, $-CH=N-$, $-CF=N-$, $>CH-O-$, $>C=CH-$, $>C=CF-$, $>C=N-$, $>N-CH_2-$, $>CH-CF<$, $>CF-CF<$, $>C=C<$, and Si, in the general formula

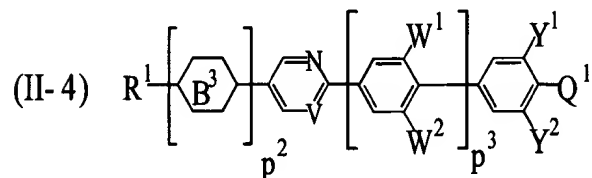
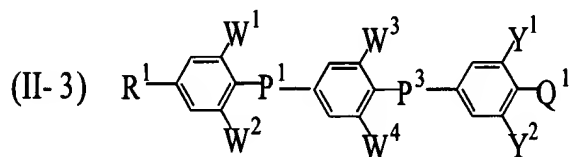
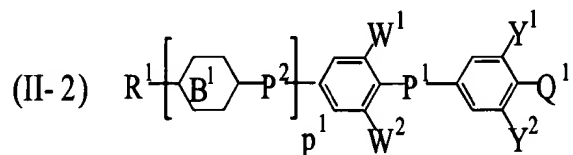
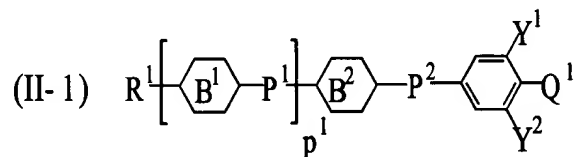
(I-4) in which R^1 is an alkyl or alkenyl group having 2 to 7 carbon atoms, Q^1 is F, Cl, CF_3 , or OCF_3 , or CN ; and X^1 and X^2 represent H, F, Cl, CF_3 , OCF_3 ; and

(I-bx) compound in which $k^1=k^2=0$, the ring A^1 is trans-1,4-cyclohexylene, 1,4-phenylene, 3-fluoro-1,4-phenylene, 3,5-difluoro-1,4-phenylene, naphthalene-2,6-diyl, 1,2,3,4-tetrahydronaphthalene-2,6-diyl, or decahydronaphthalene-2,6-diyl, K^1 is a single bond, $-(CH_2)_2-$, $-(CH_2)_4-$, or $-COO-$, and

(I-bxi) compound in which $k^1=1$, $k^2=0$, rings A^1 and A^2 represent trans-1,4-cyclohexylene, 1,4-phenylene, 3-fluoro-1,4-phenylene, 3,5-difluoro-1,4-phenylene, naphthalene-2,6-diyl, 1,2,3,4-tetrahydronaphthalene-2,6-diyl, or decahydronaphthalene-2,6-diyl, and K^1 and K^2 each represents a single bond, $-(CH_2)_2-$, $-(CH_2)_4-$, or $-COO-$, in the general formula (I-5) in which R^1 is

an alkyl or alkenyl group having 2 to 7 carbon atoms, Q^1 is F, Cl, CF_3 , or OCF_3 , ~~or CN~~, and W^1 and W^2 represent H, F, Cl, CF_3 , or OCF_3 .

Claim 5 (Previously Presented): A nematic liquid crystal composition according to claim 1, wherein said liquid crystal component B contains one, or two or more kinds of compounds selected from the group of compounds represented by the general formulas (II-1) to (II-4) :



(wherein R^1 each independently represents an alkyl group having 1 to 10 carbon atoms or an alkenyl group having 2 to 10 carbon atoms, said alkyl or alkenyl group can have one, or two or more F, Cl, CN, CH_3 or CF_3 as a non-substituent or substituent group, and one, or two or more CH_2 group, which

are present in said alkyl or alkenyl group, may be substituted with O, CO or COO, while O atoms do not bond with each other directly;

Q^1 each independently represents F, Cl, CF_3 , OCF_3 , OCF_2H , $OCFH_2$, NCS, or CN;

W^1 to W^4 each independently represents H, F, Cl, CF_3 , OCF_3 , or CN, and also W^4 each independently represents CH_3 ;

Y^1 and Y^2 each independently represents H, F, Cl, or OCF_3 ;

V represents CH or N;

p^1 to p^3 each independently represents, a single bond, $-COO-$, $-OCO-$, $-CH_2O-$, $-OCH_2-$, $-(CH_2)_2-$,

$-(CH_2)_4-$, $-CH=CH-(CH_2)_2-$, $-(CH_2)_2-CH=CH-$, $-CH=N-$, $=CH=N-N=CH-$, or $-N(O)=N-$, and

p^1 and p^3 each independently represents $-CH=CH-$, $-CF=CF-$, or $C \equiv C-$;

rings B^1 to B^3 each independently represents trans-1,4-cyclohexylene, trans-1,4-cyclohexenylene, trans-1,3-dioxane-2,5-diyl, trans-1-sila-1,4-cyclohexylene, or trans-4-sila-1,4-cyclohexylene, and the ring B^3 may also be 1,4-phenylene, 2- or 3-fluoro-1,4-phenylene, 3, 5-

difluoro-1,4-phenylene, 2- or 3-chloro-1,4-phenylene, 2, 3-dichloro-1,4-phenylene, or 3,5- dichloro-1,4-phenylene;

one, or two or more hydrogen atoms, which are present in a side chain group R^1 , a polar group Q^1 , linking groups P^1 to P^3 and rings B^1 to B^3 , may be substituted with a deuterium atom;

p^1 to p^3 each independently represents 0 or 1, and $p^2 + p^3$ is 0 or 1; and

atoms, which constitute the compounds of the general formulas (II-1) to (II-4), may be substituted with isotope atoms thereof) .

Claim 6 (Original): A hematic liquid crystal composition according to claim 5, wherein said liquid crystal component B contains one to twenty kinds of compounds selected from one, two, or three or more sub-groups among the following sub-groups (II-ai) to (II-zxii), the content of said compounds being within a range from 10 to 100% by weight:

(II-ai) compounds in which R^1 is an alkyl or alkenyl group having 2 to 5 carbon atoms, in the general formulas (II-1) to (II-4);

(II-aii) compounds in which Q^1 is F, Cl, or $-OCF_3$, in the general formulas (II-1) to (II-4);

(II-aiii) compounds in which P^2 is $-(CH_2)_2-$ or $-(CH_2)_4-$, in the general formula (II-1);

(II-aiv) compound in which p^1 is 1, in the general formula (II-1);

(II-av) compound in which at least one of Y^1 , Y^2 , W^1 and W^2 is F, in the general formula (II-2);

(II-avi) compound in which p^1 is 1 and P^1 is $-C\equiv C-$, in the general formula (II-2);

(II-avii) compound in which P^2 is a single bond or $-(CH_2)_2-$ and P^1 is $-COO-$, in the general formula (II-2);

(II-aviii) compound in which at least one of Y^1 , Y^2 , and W^1 to W^4 is F, in the general formula (II-3);

(II-aix) compound in which P^3 is $-C\equiv C-$, in the general formula (II-3);

(II-ax) compound in which P^1 is a single bond or $-C\equiv C-$ and P^3 is $-COO-$, in the general formula (II-3);

(II-axi) compound represented by the general formula (II-4); and

(II-axii) compound in which at least one of rings B^1 to B^3 is substituted with a deuterium atom if the rings B^1 to B^3 represent trans-1,4-cyclohexylene, in the general formulas (II-1), (II-2) and (II-4).

Claim 7 (Original): A nematic liquid crystal composition according to claim 5, wherein said liquid crystal component B contains one to twenty kinds of compounds selected from one, two, or three or more sub-groups among the following sub-groups (II-bi) to (II-bviii), the content of said compounds being within a range from 10 to 100% by weight:

(II-bi) compound in which R^1 is an alkyl or alkenyl group having 2 to 5 carbon atoms, p^1 is 0, and Q^1 is $-CN$, in the general formula (II-1);

(II-bii) compound in which R^1 is an alkyl or alkenyl group having 2 to 5 carbon atoms, p^1 is 1, Q^1 is F or $-CN$, and $Y1$ and $Y2$ represent H or F, in the general formula (II-1);

(II-biii) compound in which R^1 is an alkyl or alkenyl group having 2 to 5 carbon atoms, p^1 is 0, Q^1 is -CN, and Y^1 , Y^2 , W^1 and W^2 represent H or F, in the general formula (II-2);

(II-biv) compound in which R^1 is an alkyl or alkenyl group having 2 to 5 carbon atoms, p^1 is 1, P^2 is a single bond, $-(CH_2)_2-$, or $-COO-$, P^1 is a single bond, $-COO-$, or $-C\equiv C-$, Q^1 is F or -CN, and Y^1 , Y^2 , W^1 and W^2 represent H or F, in the general formula (II-2);

(II-bv) compound in which R^1 is an alkyl or alkenyl group having 2 to 5 carbon atoms, and one of P^1 and P^3 is a single bond and other one is a single bond, $-COO-$, or $-C\equiv C-$, in the general formula (II-3);

(II-bvi) compound in which R^1 is an alkyl or alkenyl group having 2 to 5 carbon atoms, and Y^1 , Y^2 and W^1 to W^4 represent H or F, in the general formula (II-3);

(II-bvii) compound in which R^1 is an alkyl or alkenyl group having 2 to 7 carbon atoms, and $p^2+p^3=0$, in the general formula (II-4); and

(II-bviii) compounds of the general formulas (II-1) to (II-2) in which at least one hydrogen atom of rings B^1 and B^2 is substituted with a deuterium atom if rings B^1 and B^2 represent trans-1,4-cyclohexylene.

Claim 8 (Previously Presented): A nematic liquid crystal composition according to claim 5, wherein said liquid crystal component B contains one to twenty kinds of compounds selected from one, two, or three or more sub-groups among the following sub-groups (II-ci) to (II-civ), the content of said compounds being within a range from 10 to 100% by weight:

(II-ci) compound in which R^1 is an alkyl or alkenyl group having 2 to 5 carbon atoms, p^1 is 1, one of P^1 and P^2 is a single bond and other one is a single bond, $-\text{COO}-$, $-(\text{CH}_2)_2-$, or $-(\text{CH}_2)_4$, Q^1 is F, Cl, CF_3 , OCF_3 , or OCF_2H , and one, or two or more of Y^1 and Y^2 represent F, in the general formula (II-1);

(II-cii) compound in which R^1 is an alkyl or alkenyl group having 2 to 5 carbon atoms, p^1 is 1, P^2 is a single bond, $-(\text{CH}_2)_2-$, or $-\text{COO}-$, P^1 is a single bond, $-\text{COO}-$, or $-\text{C}\equiv\text{C}-$, Q^1 is F, Cl, CF_3 , OCF_3 , or OCF_2H , one, or two or more of Y^1 and Y^2 represent F, and W^1 and W^2 represent H or F, in the general formula (II-2);

(II-ciii) compound in which R^1 is an alkyl or alkenyl group having 2 to 5 carbon atoms, one of P^1 and P^3 is a single bond and the other one is a single bond, $-\text{COO}-$, or $-\text{C}\equiv\text{C}-$, Q^1 is F, Cl, CF_3 , OCF_3 , or OCF_2H , one, or two or more of Y^1 and Y^2 represent F, and W^1 to W^4 represent H or at least one of them is F, in the general formula (II-3); and

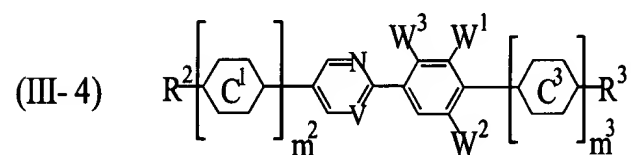
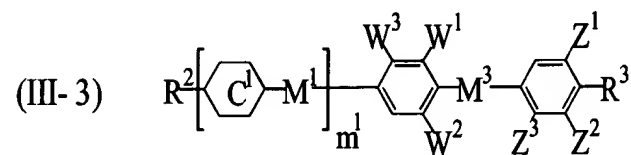
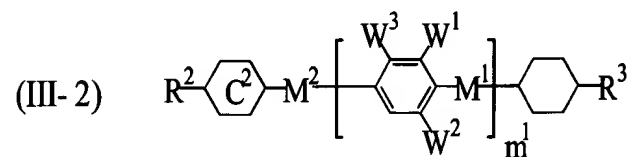
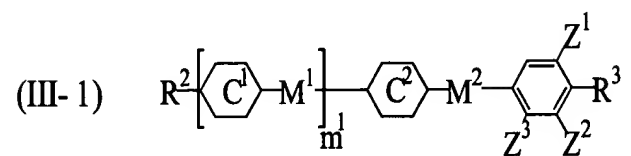
(II-civ) compound of the general formulas (II-1) and (II-2) in which at least three hydrogen atoms of rings B^1 and B^2 are substituted with a deuterium atom if rings B^1 and B^2 represent trans-1,4-cyclohexylene.

Claim 9 (Previously Presented): A nematic liquid crystal composition according to claim 1, wherein said liquid crystal component C contains compounds selected from the group of compounds represented by the general formulas (III-1) to (III-4) :

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(wherein W^1 to W^3 each independently represents H, F, Cl, CF_3 , OCF_3 , or CN;

V represents CH or N;

R^2 and R^3 each independently represents an alkyl or alkoxy group having 1 to 10 carbon atoms or an alkenyl or alkenyloxy group having 2 to 10 carbon atoms, said alkyl, alkoxy, alkenyl or alkenyloxy group can have one, or two or more F, Cl, CN, CH_3 or CF_3 as a non-substituent or substituent group, and one, or two or more CH_2 group, which are present in said alkyl, alkoxy, alkenyl or alkenyloxy group, may be substituted with O, CO or COO, while O atoms do not bond with each other directly;

Z^1 to Z^3 each independently represents H, F, Cl, CF_3 , OCF_3 , or CN, and Z^3 each independently represents $-CH_3$;

M^1 to M^3 each independently represents, a single bond, $-COO-$, $-OCO-$, $-CH_2O-$, $-OCH_2-$, $-(CH_2)_2-$, $-(CH_2)_4-$, $-CH=CH-(CH_2)_2-$, $-(CH_2)_2-CH=CH-$, $-CH=N-$, $=CH=N-N=CH-$, or $-N(O)=N-$, and M^1 and M^3 each independently represents $-CH=CH-$, $-CF=CF-$, or $C\equiv C-$;

rings C^1 to C^3 each independently represents trans-1,4-cyclohexylene, trans-1,4-cyclohexenylene, trans-1,3-dioxane-2,5-diyl, trans-1-sila-1,4-cyclohexylene, trans-4-sila-1,4-cyclohexylene, naphthalene-2,6-diyl, 1,2,3,4-tetrahydronaphthalene-2,6-diyl, or decahydronaphthalene-2,6-diyl, naphthalene-2,6-diyl and 1,2,3,4-tetrahydronaphthalene-2,6-diyl can have one, or two or more F, Cl, CF_3 , OCF_3 or CH_3 as a non-substituent or substituent group, and rings C^1 and C^3 may also be 1,4-phenylene, 2- or 3-fluoro-1,4-phenylene, 2,3-difluoro-1,4-

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phenylene, 3,5-difluoro-1,4-phenylene, 2- or 3-chloro-1,4-phenylene, 2,3- dichloro-1,4-phenylene, or 3,5-dichloro-1,4-phenylene;

one, or two or more hydrogen atoms, which are present in side chain groups R^2 and R^3 , linking groups M^1 to M^3 and rings C^1 to C^3 , may be substituted with a deuterium atom;

m^1 to m^3 each independently represents 0 or 1, and $m^2 + m^3$ is 0 or 1; and

atoms, which constitute the compounds of the general formulas (III-1) to (III-4), may be substituted with isotope atoms thereof).

Claim 10 (Original): A nematic liquid crystal composition according to claim 9, wherein said liquid crystal component C satisfies at least one of the following conditions:

(i) said liquid crystal component C contains one, or two or more kinds of compounds selected from compounds represented by the general formula (III-1), the content of said selected compounds in said liquid crystal component C being within a range from 5 to 100% by weight;

(ii) said liquid crystal component C contains one, or two or more kinds of compounds selected from compounds represented by the general formula (III-2), the content of said selected compounds in said liquid crystal component C being within a range from 5 to 100% by weight;

(iii) said liquid crystal component C contains one, or two or more kinds of compounds selected from compounds represented by the general formula (III-3), the content of said selected compounds in said liquid crystal component C being within a range from 5 to 100% by weight;

(iv) said liquid crystal component C contains one, or two or more kinds of compounds selected from the compounds represented by the general formula (III-4), the content of said selected compounds in said liquid crystal component C being within a range from 5 to 100% by weight;

(v) said liquid crystal component C contains one, or two or more kinds of compounds selected from compounds represented by the general formula (III-1) and one, or two or more kinds of compounds selected from compounds represented by the general formula (III-2), the content of said selected compounds in said liquid crystal component C being within a range from 5 to 100% by weight;

(vi) said liquid crystal component C contains one, or two or more kinds of compounds selected from compounds represented by the general formula (III-1) and one, or two or more kinds of compounds selected from compounds represented by the general formula (III-3), the content of said selected compounds in said liquid crystal component C being within a range from 5 to 100% by weight;

(vii) said liquid crystal component C contains one, or two or more kinds of compounds selected from compounds represented by the general formula (III-1) and one, or two or more kinds of compounds selected from compounds represented by the general formula (III-4), the content of said selected compounds in said liquid crystal component C being within a range from 5 to 100% by weight;

(viii) said liquid crystal component C contains one, or two or more kinds of compounds selected from compounds represented by the general formula (III-2) and one, or two or more kinds

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of compounds selected from compounds represented by the general formula (III-3), the content of said selected compounds in said liquid crystal component C being within a range from 5 to 100% by weight;

(ix) said liquid crystal component C contains one, or two or more kinds of compounds selected from compounds represented by the general formula (III-2) and one, or two or more kinds of compounds selected from compounds represented by the general formula (III-4), the content of said selected compounds in said liquid crystal component C being within a range from 5 to 100% by weight;

(x) said liquid crystal component C contains one, or two or more kinds of compounds selected from compounds represented by the general formula (III-3) and one, or two or more kinds of compounds selected from compounds represented by the general formula (III-4), the content of said selected compounds in said liquid crystal component C being within a range from 5 to 100% by weight;

(xi) said liquid crystal component C contains one, or two or more kinds of compounds selected from compounds represented by the general formula (III-1), one, or two or more kinds of compounds selected from compounds represented by the general formula (III-2) and one, or two or more kinds of compounds selected from compounds represented by the general formula (III-3), the content of said selected compounds in said liquid crystal component C being within a range from 5 to 100% by weight;

(xii) said liquid crystal component C contains one, or two or more kinds of compounds selected from compounds represented by the general formula (III-1), one, or two or more kinds of compounds selected from compounds represented by the general formula (III-2) and one, or two or more kinds of compounds selected from compounds represented by the general formula (III-4), the content of said selected compounds in said liquid crystal component C being within a range from 5 to 100% by weight;

(xiii) said liquid crystal component C contains one, or two or more kinds of compounds selected from compounds represented by the general formula (III-1), one, or two or more kinds of compounds selected from compounds represented by the general formula (III-3) and one, or two or more kinds of compounds selected from compounds represented by the general formula (III-4), the content of said selected compounds in said liquid crystal component C being within a range from 5 to 100% by weight;

(xiv) said liquid crystal component C contains one, or two or more kinds of compounds selected from compounds represented by the general formula (III-2), one, or two or more kinds of compounds selected from compounds represented by the general formula (III-3) and one, or two or more kinds of compounds selected from compounds represented by the general formula (III-4), the content of said selected compounds in said liquid crystal component C being within a range from 5 to 100% by weight;

(xv) said liquid crystal component C contains one, or two or more kinds of compounds selected from compounds represented by the general formula (III-1), one, or two or more kinds of

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compounds selected from compounds represented by the general formula (III-2), one, or two or more kinds of compounds selected from compounds represented by the general formula (III-3) and one, or two or more kinds of compounds selected from compounds represented by the general formula (III-4), the content of said selected compounds in said liquid crystal component C being within a range from 5 to 100% by weight.

Claim 11 (Previously Presented): A nematic liquid crystal composition according to claim 9, wherein said liquid crystal component C contains one to twenty kinds of compounds selected from one, two, or three or more sub-groups among the following sub-groups (III-ai) to (III-axii), the content of said compounds being within a range from 10 to 100% by weight:

(III-ai) compounds in which R^2 is an alkenyl group having 2 to 5 carbon atoms, in the general formulas (III-1) to (III-4);

(III-a ii) compounds in which R^3 is a straight-chain alkenyl or alkenyloxy group having 2 to 7 carbon atoms, in the general formula (III-1) to (III-4);

(III-a iii) compounds in which m^1 is 0 and M^2 is a single bond or $-(CH_2)_2-$, in the general formula (III-1);

(III-a iv) compound in which m^1 is 1, in the general formula (III-1);

(III-a v) compound represented by the general formula (III-2);

(III-a vi) compound in which at least one of Z^1 , Z^2 and W^1 to W^3 is F, in the general formula (III-3);

(III-avii) compound in which Z^3 is F or $-CH_3$, in the general formula (III-3);

(III-aviii) compound in which m^1 is 0 and M^3 is a single bond, in the general formula (III-3);

(III-aix) compound in which m^1 is 1, M^1 is a single bond, $-OCO-$, $-CH_2O-$, $-OCH_2-$, $-(CH_2)_2-$, $-(CH_2)_4-$, $-CH=CH-(CH_2)_2-$, $-(CH_2)_2-CH=CH-$, $-CH=N-$, $-CH=N-N=CH-$, $-N(O)=N-$, $-CH=CH-$, or $-CF=CF-$, in the general formula (III-3);

(III-ax) compound in which M^1 is $COO-$ or $-C\equiv C-$ and M^3 is $-OCO-$, $-CH_2O-$, $-OCH_2-$, $-(CH_2)_2-$, $-(CH_2)_4-$, $-CH=CH-(CH_2)_2-$, $-(CH_2)_2-CH=CH-$, $-CH=N-$, $-CH=N-N=CH-$, $-N(O)=N-$, $-CH=CH-$, $-CF=CF-$, or $-C\equiv C-$, in the general formula (III-3);

(III-axi) compound represented by the general formula (III-4); and

(III-axii) compounds in which at least one hydrogen atom of rings C^1 to C^3 is substituted with a deuterium atom if rings C^1 to C^3 represent trans-1,4-cyclohexylene, in the general formulas (III-1) to (III-4).

Claim 12 (Original): A nematic liquid crystal composition according to claim 9, wherein said liquid crystal component C contains one to twenty kinds of compounds selected from one, two, or three or more sub-groups among the following sub-groups (III-bi) to (III-bix), the content of said compounds being within a range from 10 to 100% by weight:

(III-bi) compound in which R^2 is an alkyl group having 1 to 5 carbon atoms or an alkenyl group having 2 to 5 carbon atoms, R^3 is an alkyl or alkoxy group having 1 to 5 carbon atoms, or an alkenyl or alkenyloxy group having 2 to 5 carbon atoms, m^1 is 0, and M^2 is a single bond, $-COO-$, or

$-(CH_2)_2$, in the general formula (III-1);

(III-bii) compound in which R^2 is an alkyl group having 1 to 5 carbon atoms or an alkenyl group having 2 to 5 carbon atoms, R^3 is an alkyl or alkoxy group having 1 to 5 carbon atoms, or an alkenyl or alkenyloxy group having 2 to 5 carbon atoms, m^1 is 1, the ring C^1 is trans-1,4-cyclohexylene, and one of M^1 and M^2 is a single bond and other one is a single bond, $-COO-$, or a $-(CH_2)_2-$, in the general formula (III-1);

(III-biii) compound in which R^2 is an alkyl group having 1 to 5 carbon atoms or an alkenyl group having 2 to 5 carbon atoms, R^3 is an alkyl or alkoxy group having 1 to 5 carbon atoms, or an alkenyl or alkenyloxy group having 2 to 5 carbon atoms, the ring C^2 is trans-1,4-cyclohexylene or trans-1,4-cyclohexenylene, m^1 is 0, and M^2 is a single bond, $-COO-$, or $-(CH_2)_2-$, in the general formula (III-2);

(III-biv) compound in which R^2 is an alkyl group having 1 to 5 carbon atoms or an alkenyl group having 2 to 5 carbon atoms, R^3 is an alkyl or alkoxy group having 1 to 5 carbon atoms, or an alkenyl or alkenyloxy group having 2 to 5 carbon atoms, the ring C^2 is trans-1,4-cyclohexylene or trans-1,4-cyclohexenylene, m^1 is 1, and one of M^1 and M^2 is a single bond, in the general formula (III-2);

(III-bv) compound in which R^2 is an alkyl group having 1 to 5 carbon atoms or an alkenyl group having 2 to 5 carbon atoms, R^3 is an alkyl or alkoxy group having 1 to 5 carbon atoms, or an alkenyl or alkenyloxy group having 2 to 5 carbon atoms, m^1 is 0, and M^3 is a single bond, $-C\equiv C-$, or $-CH=N-N=CH-$, in the general formula (III-3);

(III-bvi) compound in which R^2 is an alkyl group having 1 to 5 carbon atoms or an alkenyl group

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having 2 to 5 carbon atoms, R^3 is an alkyl or alkoxy group having 1 to 5 carbon atoms, or an alkenyl or alkenyloxy group having 2 to 5 carbon atoms, m^1 is 1, M^1 is a single bond, $-(CH_2)_2-$, $-COO-$, or $-C\equiv C-$, and M^2 is a single bond, $-COO-$, or $-C\equiv C-$, in the general formula (III-3);

(III-bvii) compound in which R^2 is an alkyl group having 1 to 5 carbon atoms or an alkenyl group having 2 to 5 carbon atoms, R^3 is an alkyl or alkoxy group having 1 to 5 carbon atoms, or an alkenyl or alkenyloxy group having 2 to 5 carbon atoms, m^1 is 1, one of M^1 and M^3 is a single bond and other one is a single bond or $-C\equiv C-$, and at least one of W^1 and W^2 is F, in the general formula (III-3);

(III-bviii) compound in which R^2 is an alkyl group having 1 to 5 carbon atoms or an alkenyl group having 2 to 5 carbon atoms, R^3 is an alkyl or alkoxy group having 1 to 5 carbon atoms, or an alkenyl or alkenyloxy group having 2 to 5 carbon atoms, and any one of Z^2 and Z^3 is substituted with F or CH_3 , in the general formula (III-3); and

(III-bix) compound in which R^2 is an alkyl group having 1 to 5 carbon atoms or an alkenyl group having 2 to 5 carbon atoms, R^3 is an alkyl or alkyloxy group having 1 to 5 carbon atoms, or an alkenyl or alkenyloxy group having 2 to 5 carbon atoms, and $m^2+m^3=0$, in the general formula (III-4).

Claim 13 (Previously Presented): A nematic liquid crystal composition according to claim 1, wherein said liquid crystal composition contains one, or two or more kinds of core-structure

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compounds which have four six-membered rings and a liquid crystal phase- isotropic liquid phase transition temperature of 100°C or higher.

Claim 14 (Previously Presented): A nematic liquid crystal composition according to claim 1, wherein said liquid crystal composition has a dielectric constant anisotropy within a range from 2 to 40, a birefringent index within a range from 0.02 to 0.40, a nematic phase-isotropic liquid phase transfer temperature within a range from 50 to 180°C or higher, and a crystal phase-, smectic phase- or glass phase-nematic phase transfer temperature within a range from -200 to 0°C.

Claim 15 (Previously Presented): A nematic liquid crystal composition according to claim 1, wherein said liquid crystal composition contains a compound having an optically active group capable of securing an induced helical pitch within a range from 0.5 to 1000 μ m.

Claim 16 (Previously Presented): An active matrix, twisted nematic or super twisted nematic liquid display device using the nematic liquid crystal composition of claim 1.

Claim 17 (Previously Presented): A light scattering type liquid display device comprising a light modulation layer which contains the liquid crystal composition of claim 1 and a transparent solid substance.

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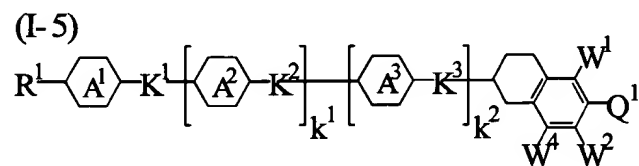
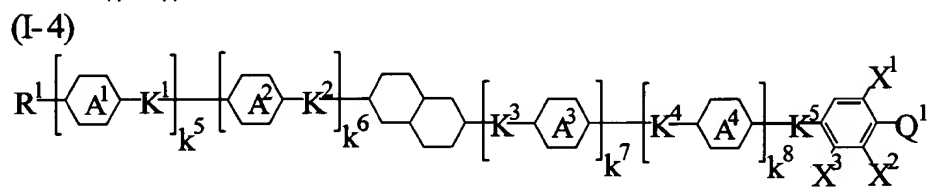
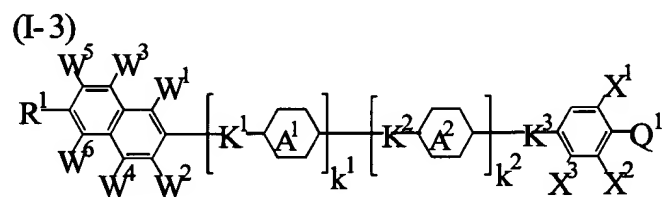
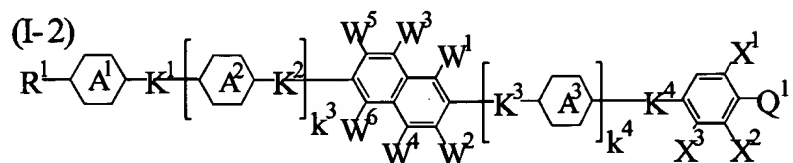
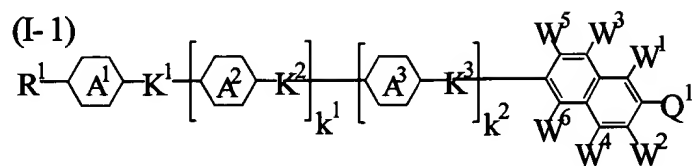
Claim 18 (Original): A light scattering type liquid display device according to claim 17, wherein said liquid crystal composition formed a continuous layer in said light modulation layer and said transparent solid substance formed a uniform three-dimensional network in said continuous layer.

Claim 19 (Previously Presented): A nematic liquid crystal composition comprising a liquid crystal component A composed of one kind of compound represented by a general formula selected from the general formulas (I-1) to (I-5):

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(wherein one, or two or more CH groups, which are present in a naphthalene-2,6-diyl ring, may be substituted with a N group,

one, or two or more -CH₂- groups, which are present in a decahydronaphthalene-2,6-diyl ring, may be substituted with -CF₂-, one, or two or more -CH₂-CH₂- groups, which are present in said ring, may be substituted with -CH₂O-, -CH=CH-, -CH=CF-, -CF=CF-, -CH=N- or -CF=N-, one, or two or more >CH-CH₂- groups, which are present in said ring, may be substituted with >CH-O-, >C=CH-, >C=CF-, >C=N- or .N-CH₂-, a >CH-CH< group, which is present in the ring, may be substituted with >CH-CF<, >CF-CF< or >C-C<, and at least one C in said non-substituted or substituted ring may be substituted with Si;

R¹ each independently represents an alkyl group having 1 to 10 carbon atoms or an alkenyl group having 2 to 10 carbon atoms, said alkyl or alkenyl group can have one, or two or more F, Cl, CN, CH₃ or CF₃ as a non-substituent or substituent group, and one, or two or more CH₂ groups may be substituted with O, CO or COO, while O atoms do not bond with each other directly;

Q¹ each independently represents F, Cl, CF₃, OCF₃, OCF₂H, OCFH₂, NCS, or CN;

X¹ to X² each independently represents H, F, Cl, CF₃, OCF₃, or CN; X³ each independently represents H, F, Cl, CF₃, OCF₃, CN, or CH₃;

W¹ to W⁶ each independently represents H, F, Cl, CF₃, OCF₃, or CN, and also W⁴ each independently represents CH₃, and at least one of W¹ to W⁶ is F, Cl, CF₃, OCF₃, or CN;

K¹ to K⁵ each independently represents, a single bond, -COO-, OCO-, -CH₂O-, -CH=CH-, -CF=CF-, =C≡C-, -(CH₂)₂-, -(CH₂)₄-, -CH=CH-(CH₂)₂-, -(CH₂)₂-CH=CH-, -CH=N-, =CH=N=N-CH-

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, or -N(O)=N-;

rings A¹ to A⁴ each independently represents 1,4-phenylene, 2- or 3-fluor-1,4-phenylene, 2,3-difluoro-1,4-phenylene, 3,5-difluoro-1,4-phenylene, 2- or 3-chloro-1,4-phenylene, 2,3-dichloro-1,4-phenylene, 3,5-dichloro-1,4-phenylene, pyrimidine-2,5-diyl, trans-1,4-cyclohexylene, trans-1,4-cyclohexenylene, trans-1,3-dioxane-2,5-diyl, trans-1-sila-1,4-cyclohexylene, trans-4-sila-1,4-cyclohexylene, naphthalene-2,6-diyl, 1,2,3,4-tetrahydronaphthalene-2,6-diyl, or decahydronaphthalene-2,6-diyl, and naphthalene-2,6-diyl and 1,2,3,4-tetrahydronaphthalene-2,6-diyl can have one, or two or more F, Cl, CF₃ or CH₃ as a non-substituent or substituent group;

one, or two or more hydrogen atoms, which are present in a naphthalene-2,6-diyl ring, a 1,2,3,4-tetrahydronaphthalene-2,6-diyl ring, a decahydronaphthalene-2,6-diyl ring a side chain group R¹, a polar group Q¹, linking groups K¹ to K⁵ and rings A¹ to A⁴, may be substituted with a deuterium atom;

k¹ to k⁸ each independently represents 0 or 1, k³ + k⁴ is 0 or 1, and k⁵ + k⁶ + k⁷ + k⁸ is 0, 1 or 2; and

atoms, which constitute the compounds of the general formulas (I-1) to (I-5), may be substituted with isotope atoms thereof; 0 to 99.9% by weight of a liquid crystal component B composed of a compound having a dielectric constant anisotropy of +2 or more as a liquid crystal component excluding the compounds of the general formulas (I-1) to (I-5); and 0 to 85% by weight of a liquid crystal component C composed of a compound having a dielectric constant anisotropy within a range from -10 to +2; the sum total of said liquid crystal component B and said liquid

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crystal component C being within a range from 0 to 99.9% by weight.